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(71) Applicant: Jacuzzi Europe Spa
S.S. Pontebbana km 97,2
I-33098 Valvasone (Pordenone)(IT)

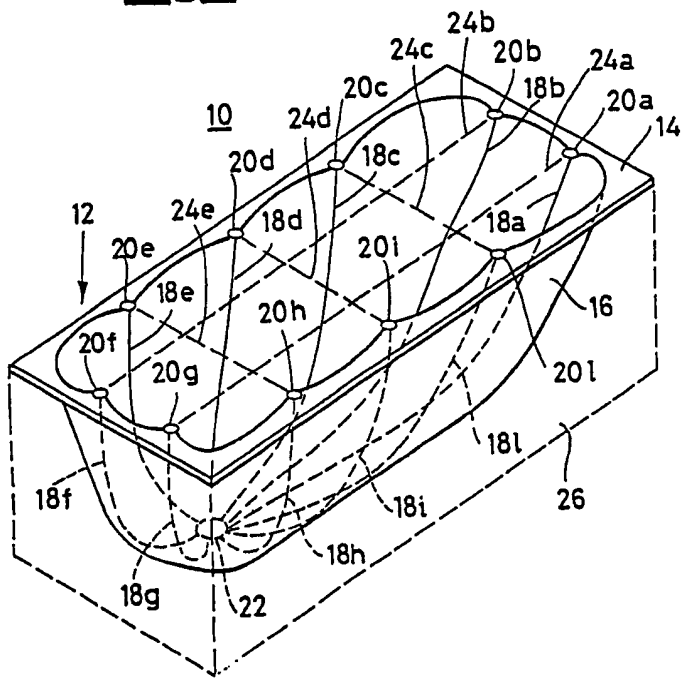
(72) Inventor: Urbinati, Carlo
Via Leone Dheon 54
I-00100 Roma(IT)

(74) Representative: Dragotti, Gianfranco et al
SAIC BREVETTI s.r.l. Viale Bianca Maria, 15
I-20122 Milano(IT)

(54) Bathtub having selfsustaining walls.

(57) Bathtub (20), provided with modularly arranged strengthening areas (18), in order to produce a self-sustaining structure with walls thin enough for the outside shape of the shell to reproduce the inside shape of the shell, allowing to pile-up, for storing and shipping, a plurality of tubs.

Fig.1



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Bathtub having selfsustaining walls

Bathtub, provided with modularly arranged strengthening areas, in order to produce a self-sustaining structure with so thin walls that the outside of the tub repeats the inside thereof, allowing to pile-up, for storing and shipping, a plurality of tubs.

Present invention pertains to bathtubs and in particular bathtubs manufactured from plastic materials.

Today there is the use of manufacturing plastic material bathtubs for reasons of low cost and easy working. The process used to be followed is that of vacuum thermoshaping through which a plastic material sheet, for example from methyl metacrylate, usually well stiff at ambient temperature as well as at the usual temperature of hot water in a bathtub, is heated to the softening point and laid down against a hollow mold by applying a vacuum at suitable points.

This process produces tub shells having excellent shape and finishing needing few, if any, further working for having their ultimate appearance and the full utilizability.

The only serious problem with these so obtained shells is their intrinsic brittleness or weakness, due to wall thinness, preventing their direct use in installations, as said shells could easily open or crack even under relatively mild strains. A largerly used remedy against this problems consists in exterally coating said shells by means of glass fabric layers soaked by hardenable resins, such as polyesters, producing a sustaining structure provided with substantial mechanical strenght in order to however prevent damages to said shell, specifically the ones connected with the use of a bathtub.

This external coating with glass fabric layers soaked by hardenable resin has however, further to give the external wall of the tub a poor aesthetic appearance, the serious problem of raising the wall thickness thereof to the point to allow just a partial entry of the external part of a tub in the internal part of another tub so that in storing and shipping people are compelled to take into account an encumbrance similar to a parallelepiped enclosing the same, with poor space use problems heavily affecting said storage and shipping costs.

To avoid this excessive encumbrance problem should be devised bathtub shells with such a self-sustaining structure to prevent substantial distortions thereof under usual strains due to use or piling-up, but altogether so thin to allow piling-up with entry of any shell in each other leading to both storage and shipping space substantial economies. To allow a tub manufacture comprising a simple completely selfsustaining shell characteried by having inserted a rib structure, consisting of a modular grid, having the duty, of uniformely distribute in said shell the strains due to the load of water and, possibly, or a person lying in said tub, said strains loading, by means of said ribs or ridges, mainly supports under the bottom of said tub.

According to a first embodiment, said modular structure comprises a radial rib assembly depending from a shell edge and joining in a point on the bottom thereof, said ribs starting from points distributed on said shell edge in order to form a rectangular grid with substantially uniform members having the duty of distributing the most uniformly the possible said strains.

In particular, said ribs converging on the bottom are connected each other by curved surfaces, either hollow or convex with respect to the shell inside, giving the shell an appearance as of a sea shell and a particularly high strength.

Preferably, the curved surfaces connecting said ribs are arranged symmetrically around a longitudinal axis of said shell with a hollow first major surface, symmetrically divided by said longitudinal axis, going from the upper edge at the head side to the convergence point of the ribs on the bottom of the shell, flanked by two hollow curved surfaces in turn adjacent third hollow surfaces continuining in fourth surfaces, which can be either hollow or convex, in turn continuing in fifth hollow surfaces adjacent a last hollow surface symmetrically divided by said shell longitudinal axis at the foot side of the tub.

More preferably said first hollow major surface is so shaped to form an anatomic back.

Still more preferably, said two second hollow surfaces, adjacent said first hollow surface, form niches delimited at half height by bottom planes forming two arms.

Further preferably, said fourth curved convex surfaces end as lowered with respect to the tub edge forming two support planes symmetrically arranged with respect to the longitudinal axis of the tub itself.

According to a second embodiment, said modular shell structure is formed by an assembly of protruding and re-entring areas connected by ribs similar to the ribs sustaining a boat planking, which are formed by connecting surfaces between said protruding areas and said re-entring areas, said ribs being arranged in two substantially perpendicular groups each other intersecting in order to form a rectangular grid having substantially uniform members and having the duty of distributing the most uniformely the possible said strains.

Particularly the areas protruding to inside said

shell form as two substantially perpendicular bands of which a first major band is parallel and symmetric with respect to a longitudinal axis of said shell and a second minor band is substantially perpendicular with respect to said first major band intersecting it at a place substantially near the foot side of said shell.

More preferably, said first major band is shaped at the head side of said shell in order to form an anatomic back.

Still preferably, two re-entring areas adjacent said major band at head side are provided with two niches delimited at half height by bottom planes forming two arms.

Further preferably, said second protruding minor band ends against the edge of the tub with two lowered areas forming two support planes symmetrically arranged with respect to the longitudinal axis of the shell itself.

The features and the advantages of the present invention will be made more apparent by the following detailed description of its embodiments, not given in limiting sense provided with the enclosed drawings, wherein:

figure 1 is a diagrammatical perspective view of a selfsustaining tub shell structure according to a first embodiment of present invention;

figure 2 is a diagrammatical perspective view of selfsustaining tub shell structure according to a second embodiment of present invention;

figure 3 is a perspective view of an installed bathtub formed by a selfsustaining shell of the first embodiment;

figure 4 is a perspective view of an installed bathtub formed by a selfsustaining shell of the second embodiment.

Considering the first embodiment and particularly figure 1, it is seen that the first tub 10 embodiment, having selfsustaining walls according to the present invention, consists of a shell 12, formed for example by vacuum themoshaping of a thermoplastic material sheet, comprising an edge 14 according to a substantially rectangular frame from which depends a hull 16 forming the part of the tub intended to contain the water. From the edge 14 along the internal walls of the tub depend ribs or ridges 18a-l which, starting from points 20a-l on the edge of the hull 16, descend to a connection area 22 usually strengthened for housing accesories such as the tub drain. The points 20a-l are arranged in order to lay on a grid having rectangular substantially regular loops formed by intersecting straight lines 24a-e which provides a substantially uniform distribution of the strains on the hull 16 due to the presence of water and/or of the body of a person in the tub 10. Of course, said tub 10 abuts in a usual way with its bottom and edge 14 on a structure 26, such as a brick wall structure tiled or panelled, and also on the floor of the room in which the bathtub is installed.

Considering now the second embodiment of this tub and particularly figure 2 in this case a selfsustaining wall tub 30 according to the present invention consists of a shell 32 also formed by vacuum thermoshaping from a thermoplastic material sheet, comprising an edge 34 according to a rectangular fram frome which a hull 36, forming the part of the tub intedend to contain water, descends.

The internal walls of the hull 36 have two inside protruding areas of which a first major area or band 38 is arranged parallel and symmetric with respect to a longitudinal axis 39 of the tub itself and a minor area or band 40 is sustantially perpendicular with respect to the major area 38 crossing the same near the foot side of the tub. The two band areas 38 and 40 delimit adjacent lowered areas 42a-f, of which two areas 42b and 42e have intermediate depth and four areas 42a, 42c, 42d, and 42f are the deepest, forming among them rib connections 44a-l having a strengthening duty similar to that of the ribs of a boat hull. The rib connections 44a-l are in line with straight lines 45a-e crossing each other to form a grid having rectangular uniform loops providing a substantially uniform distribution of the strains applied to the hull 36 by the presence of water and/or the body of a person in the bathtub itself.

Of course, said tub 30, showing on the external wall of its hull 36 re-entring band areas 46 and 48 respectively corresponding to band areas 38 and 40 inside protruding, abuts in a usual way with its bottom and the edge 34 against a structure 50, such as a brick structure, tilable or panelable for aesthetic purposes, as well as on the floor of the room in which the bathtub is installed.

From the review of figures 1 and 2 it appears that in both the tub embodiments the external walls of the respective shells 12 and 32 repeat substantilly on the contrary the internal walls, in the sense that to protruding members in the internal walls correspond re-entring members in the external walls and viceversa. This fact allows to superimpose and entry one into the other the shells 12 or 32 of similar kind which can be each other piled-up without damages with the simple interposition on thin antiscratch material sheets in order to use at most the room in stores and shipping means. For example, these shells 12 and 32 lend themselves very well to storage in compact packages and to shipping in standard modular containers allowing their maximum filling.

Referring now to figure 3 it is seen an installed bathtub having ribbed shell embodied according to figure 1 example.

In a corner of a bathroom between two tiled vertical walls 60 and 62 and also a tiled floor 64, is

installed a bathtub manufactured according to the tub 10, having the ribbed shell 12 of figure 1.

Said tub, surrounded and supported by a brick structure, defined by the tiled walls 66 and 68, comprises a rectangular frame edge 74 from which descends a ribbed shell 76 provided with ribs protruding to the inside indicating the limits among hollow surfaces such as the surfaces 78a-h, or between hollow and convex surfaces, such as the surfaces 80a and 80b terminating a little below the rectangular edge 74 for defining two article support planes 82a and 82b.

Further, the hollow surfaces 78b and 78h are formed as deep niches housing, at half height, support planes having duty of arms 84 and 85 and the hollow surface 78a is so shaped to form an anatomic back affording particular comfort to the bathtub.

Referring at last to figure 4, it is seen an installed bathtub having a ribbed shell according to the embodiment of figure 2.

In a corner of a bathroom between two vertical tiled walls 60 and 62 and an also tiled floor 64 is installed a bathtub manufactured according to the tub 30, having ribbed shell 32 of figure 2. Said tub, surrounded and supported by a brick structure defined by the tiled walls 66 and 68, comprises a rectangular frame edge 94 from which descends a ribbed shell 96 provided with a first major raised band area 98 arranged according to the length of the tub, and with a second minor raised band area 100 substantially perpendicular with respect to the major band area 98, said band area 100 terminating with two planes 102a and 102b a little below the frame 94 operating as article supporting planes.

At the head side of the tub the raised band 98 is surrounded by two lowered niches 104a and 104b, terminating at half height with two planes 106a, and 106b, operating as arms.

Similarly at the foot side there are two lowered areas 108a and 108b delimited by the two raised bands 96 and 100. On the bottom of the tub the lowered areas prosecute delimited by the raised bands 98 and 100 for assuring the presence of strenghtening ribs in the whole tub. The major raised band 98 is shaped at the head side to form an anatomic back 110 affording particular comfort to the tub.

A further thickness step 112 at half height supplies a supplementar or izontal rib further cooperating to strengthen the shell 96.

What has been hereabove stated depictes two embodiments of the invention, given in not limiting sense, and it will appear to those skilled in the art fully equivalent changements, alterations and substitutions, to be considered here covered.

Claims

1. Bathtub, having self sustaining walls, formed by a single shell, characterized by having provided a strengthening rib or ridge structure consisting of a modular grid, having the duty of uniformely distribute in said shell the strains due to the load of water, and possibly of a person lying in said tub, said strains loading, by means of said ribs or ridges, mainly supports under the bottom of said tub.

2. Bathtub, according to claim 1, characterized in that said shell (12) modular structure comprises a radial rib assembly (18a-l) depending from a shell edge (14) and joining in a point (22) on the bottom thereof, said ribs (18a-l) starting from points (20a-l) distributed on said shell edge (14) in order to form a rectangular grid with substantially uniform members having the duty of distributing the most uniformly the possible said strains.

3. Bathtub, according to claim 2, characterized in that said ribs (18a-l) converging on the bottom are each other connected by curved surfaces, either hollow or convex, giving the shell (12) an appearance as of a sea shell and a particularly high strength.

4. Bathtub, according to claim 3, characterized in that the curved surfaces connecting said ribs (18a-l) are arranged symmetrically around a longitudinal axis of said shell (12) with a hollow first surface (78a), symmetrically divided by said longitudinal axis, going from the upper edge (14) at the head side of the tub to the convergence point (22) of the ribs (18a-l) on the bottom of the shell (12), flanked by two hollow curved surfaces (78b, 78h) in turn adjacent third hollow surfaces (78c,78g), continuing in fourth surfaces (80a, 80b), which can be either hollow or convex, in turn continuining in fifth hollow surfaces (78d, 78f) adjacent a last hollow surface (78e) symmetrically divided by said shell (12) longitudinal axis at the foot side of the tub.

5. Bathtub , according to claim 4, characterized in that said first hollow major surface (78a) is shaped to form an anatomic back (86).

6. Bathtub, according to claim 4, characterized in that said second hollow surfaces (78b, 78h) adjacent said first hollow surface (78a) form niches delimited at half height by bottom planes forming two arms (84,85).

7. Bathtub, according to claim 4, characterized in that said fourth surfaces (80a, 80b), if convex end as lowered with respect to the edge (14), of the tub forming two support planes (82a, 82b) symmetrically arranged with respect to the longitudinal axis of the shell (12).

8. Bathtub, according to claim 1, characterized in that said modular shell (32) structure is formed

by an assembly of protruding areas (38, 40) and re-entring areas (42a-f) connected by ribs (44a-l), similar to the ribs substaining a boat planking, which are formed by connecting surfaces between said protruding areas (38, 40) and said re-entring areas (42a-f), said ribs (44a-l) being arranged in two substantially perpendicular groups each other intersecting in order to form a rectangular grid having substantially uniform members and having the duty of distributing the most uniformely the possible said strains.

9. Bathtub, according to claim 8, characterized in that the areas (38, 40) protruding to inside said shell (12), form as two substantially perpendicular bands of which a first major band (38) is parallel and symmetric with respect to a longitudinal axis (39) of said shell and a second minor band (40) is substantially perpendicular with respect said first major band (38), intersecting it at a place substantially near the foot side of said shell (12).

10. Bathtub, according to claim 9, characterized in that said first major band (38, 98) is shaped at the head side of said shell (32) in order to form an anatomic back (110).

11. Bathtub, according to claim 9, characterized in that two re-entring or lowered areas (42a-f) adjacent said major band (38, 98) at the head side are provided with two niches (104a, 104b) delimited at half height by bottom planes forming two arms (106a, 106b).

12. Bathtub, according to claim 9 characterized in that said second protruding minor band (40, 100) ends against the edge (34, 94) of the tub with two lower areas (102a, 102b) forming two support planes symmetrically arranged with respect the longitudinal axis of the shell (12) itself.

Tav.I

Fig.1

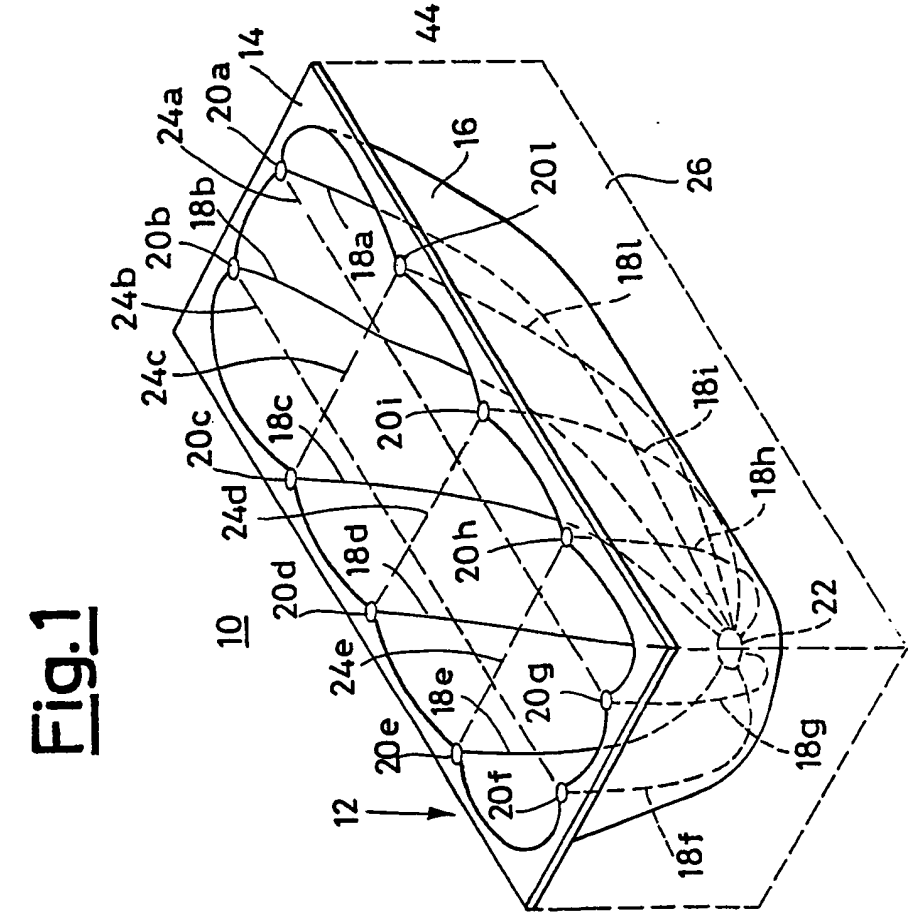
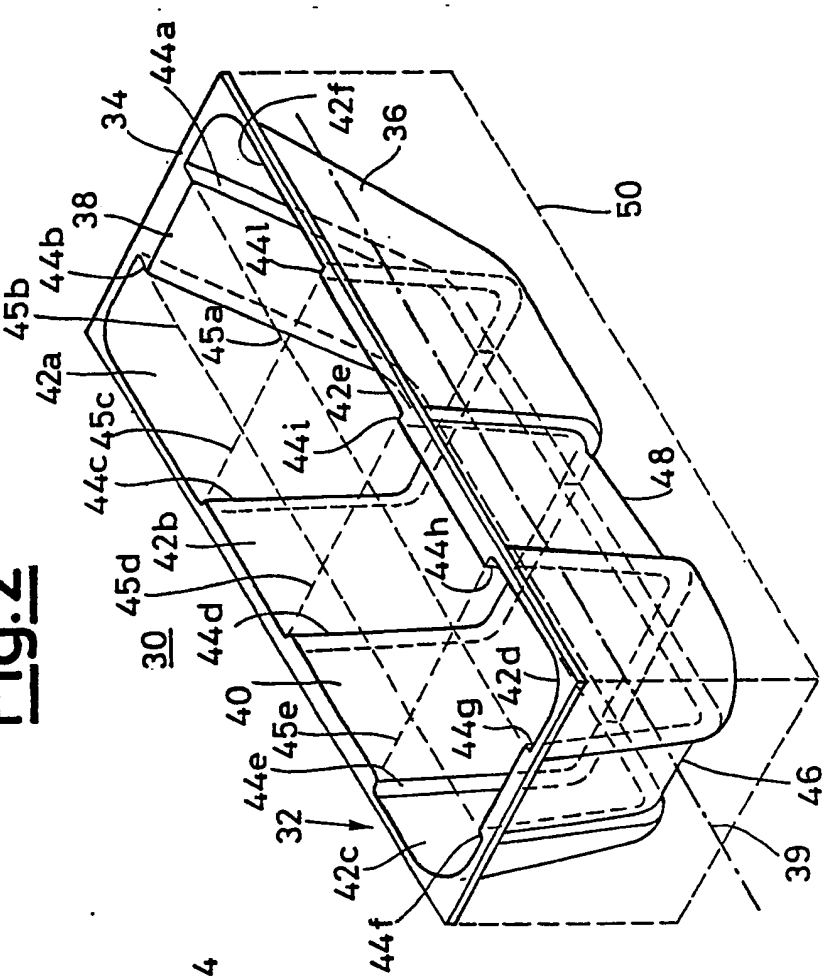


Fig.2



Tav.II

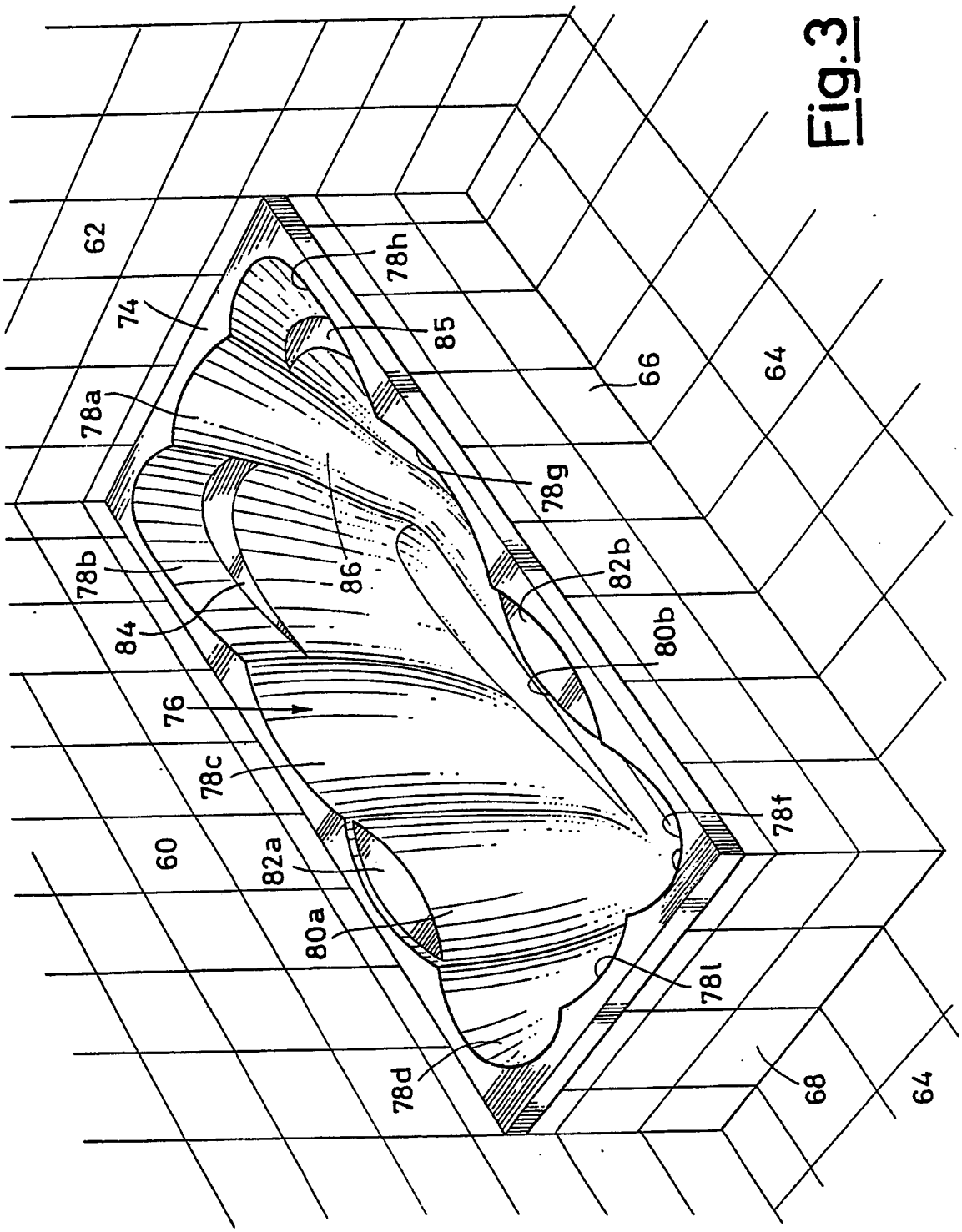

62
74
78a
78b
84
76
78c
60
82a
80a
78d
78h
85
66
64
78g
86
82b
80b
78f
78l
68
64

Fig.3

Tav. III

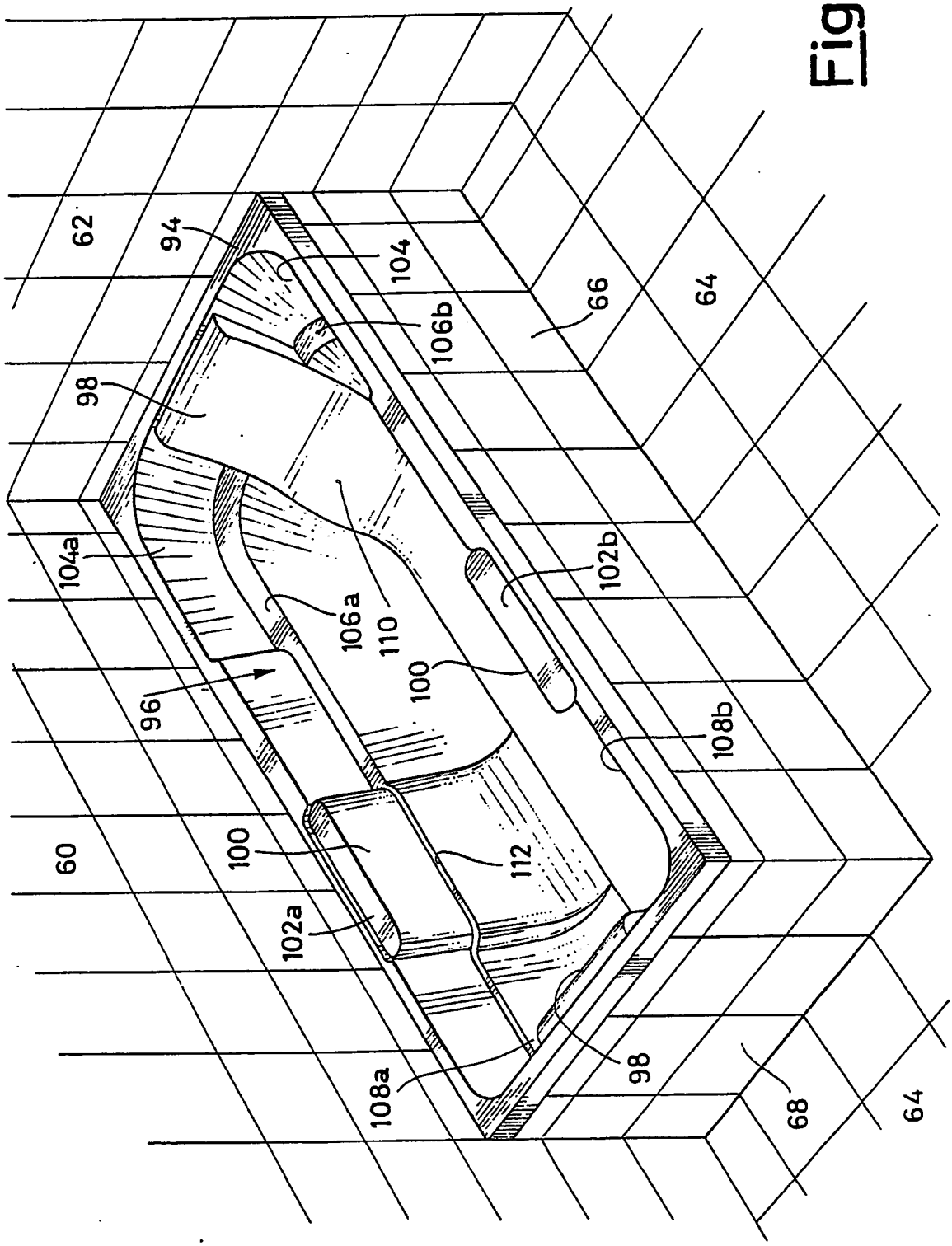

62
94
104
106b
66
64
98
104a
102b
106a
110
100
96
108b
60
100
112
102a
108a
98
68
64

Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 20 2428

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-A-2 702 295 (AHLMANN-SANITÄR-u. KUNSTSTOFFTECHNIK GmbH) * Page 6, lines 20-21; page 9, lines 16-25; figure *	1	A 47 K 3/02
A	---	6,11	
Y	US-A-3 793 653 (BROOKS) * Column 3, lines 6-12; column 4, lines 17-29; figures 1,2 *	1	
A	---		
A	EP-A-0 126 832 (K & Q KING AND QUEEN S.p.A.) * Page 3, line 25 - page 5, line 2; figures 1,2 *	1,8	
A	---		
A	US-A-3 421 162 (DIEMOND & GREENBERG) * Column 2, lines 28-69; figures 1-4 *	1-3	
A	---		
A	DE-U-8 631 326 (KAYSER) * Page 5, lines 1-10; page 6, lines 7-16; figures 1,3,9 *	1,5,6, 10,11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 47 K
E 04 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-12-1989	PORWOLL H.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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